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ELECTROTECHNICAL VOCABULARY

PART LV ELECTRIC FANS

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PART LV ELECTRIC FANS

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* Shri V. A. Krishnamurthy was the Chairman for the meeting in which this standard was finalized.

Indian Standard
ELECTROTECHNICAL VOCABULARY
PART LV ELECTRIC FANS

0. FOREWORD

0.1 This Indian Standard (Part LV) was adopted by the Indian Standards Institution on 29 June 1981, after the draft finalized by the Electrotechnical Standards Sectional Committee in consultation with the Electric Fans Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 For convenience in use and to avoid repetition of the definition of various terms used in specifications on fans, need was felt to formulate a separate standard covering definition of terms relating to fans. Individual specifications for particular type of fans will refer to this standard regarding terminology besides defining additional terms, if any used in that particular standard.

0.3 The definitions contained in this standard have been drawn up with the object of striking a correct balance between absolute precision and simplicity. The principal object of this standard (Part LV) is to provide definitions which are sufficiently clear so that each term is understood with the same meaning by all concerned. It may sometimes be felt that the definitions are not sufficiently precise, do not include all cases, do not take account of certain exceptions or are not identical with those which may be found in other publications designed with other objects and for other readers. Such differences are inevitable and should be accepted in the interest of uniformity and clarity.

1. SCOPE

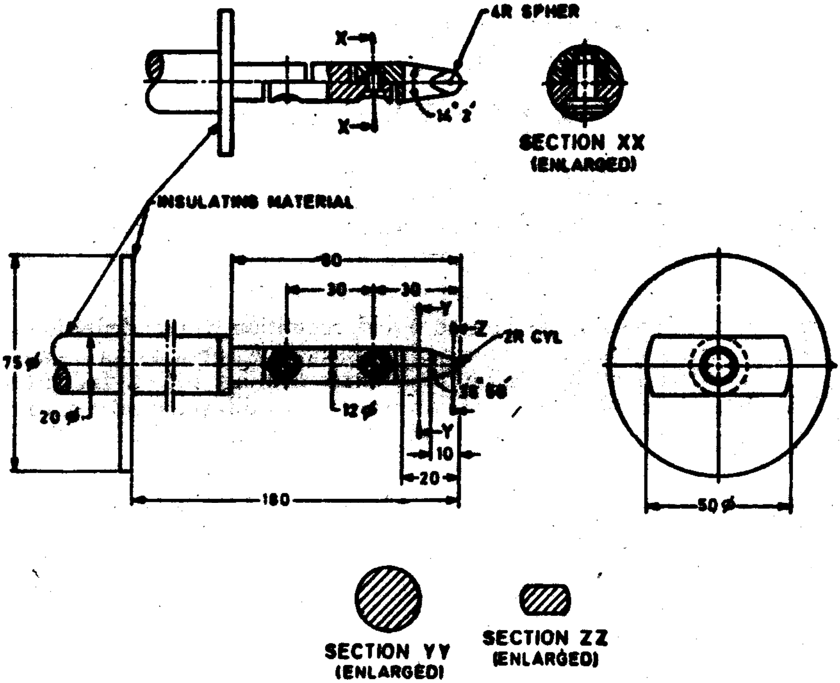
1.1 This standard (Part LV) covers definitions of terms used in specifications on electric fans.

SECTION I GENERAL DEFINITIONS

2. GENERAL TERMS

2.0 Where the terms voltage and current are used, they imply rms values, unless otherwise specified.

2.1 Accessible Parts or Accessible Surface — *A live* part or *a live* surface which can be touched by means of the standard test finger shown in Fig. 1.



Tolerances:
On angle ± 5
On linear dimensions:
Less than 25 : $^{+0}_{-\cdot05}$
Over 25 : ±·2

All dimensions in millimetres.

FIG. 1 STANDARD TEST FINGER

2.2 All-Pole Disconnection — For single phase ac fans and for dc fans, disconnection of both supply conductors by a single switching action or, for fans to be connected to more than two supply conductors, disconnection of all supply conductors, except the earthed (grounded) conductor, by a single switching action.

NOTE — The protective earthing conductor is not considered to be a supply conductor.

2.3 Blade Sweep — The diameter of the circle traced out by the extreme tips of the fan blades.

2.4 Body — The term includes all accessible metal parts, shafts of handles, knobs, grips and the like and metal foil in contact with all accessible surfaces of insulating material; it does not include inaccessible metal parts.

2.5 Casing — The stationary part of the fan which guides air to and from the impeller.

2.6 Clearance — The shortest distance between two conductive parts, or between a conductive part and the bounding surface of the fan measured through air.

Note — The bounding surface of the fan is the outer surface of the enclosure, considered as though metal foils were pressed into contact with accessible surfaces of insulating material.

2.7 Creepage Distance — The shortest path between two conductive parts, or between a conductive part and the bounding surface of the fan measured along the surface of the insulating material.

2.8 Expander — That part of an airway which enlarges gradually in the direction of the air flow.

2.9 Impeller — That part of a fan which imparts movement to the air by virtue of its rotation.

2.10 Insulation

2.10.1 *Basic Insulation* — An insulation applied to live parts to provide basic protection against electric shock.

Note 1 — Basic insulation does not necessarily include insulation used exclusively for functional purposes.

Note 2 — The insulating properties of lacquer, enamel, ordinary paper, cotton, oxide film on metal parts, beads and sealing compound shall not be relied upon to give the required protection against accidental contact with live parts.

2.10.2 *Supplementary Insulation* — An independent insulation applied in addition to the basic insulation, in order to ensure protection against electric shock in the event of a failure of the basic insulation.

2.10.3 *Double Insulation* — An insulation comprising both basic insulation and supplementary insulation.

2.10.4 *Reinforced Insulation* — A single insulation system applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation under the conditions specified in this standard.

NOTE — The term ' insulation system ' does not imply that the insulation must be one homogeneous piece. It may comprise several layers which cannot be tested singly as supplementary or basic insulation.

2.11 Mounting — Means of attaching the fan system (motor and blades) into the required working position.

2.12 Normal Load — Normal load for fan denotes operation of fan with its regulator, if any, set at the highest speed position and when:

a) Ceiling, table and pedestal type fans are operated continuously in free space with the oscillating mechanism, if any, in operation.

b) Partition type ventilating fans are operated continuously with the fan mounted in a suitable partition according to the manufacturer's instruction.

c) Free inlet, free outlet and fully ducted ventilating fans are operated continuously in a minimum size of duct for which they are designed with the distance between the fan and the end of the duct being four times the diameter of the fan.

2.13 Operation

2.13.1 *Continuous Operation* — Operation under normal load for an unlimited period.

2.13.2 *Short-Time Operation* — Operation under normal load for a specified period starting from cold, the intervals between each period of operation being sufficient to allow the fan to cool down approximately to room temperature.

2.13.3 *Intermittent Operation* — Operation in a series of specified identical cycles, each cycle being composed of a period of operation under normal load followed by a rest period with the fan running idle or switched off.

2.14 Parts

2.14.1 *Detachable Part* — A part which can be removed without the aid of tool.

2.14.2 *Non-detachable Part* — A part which can only be removed with the aid of tool.

2.15 Plane

2.15.1 *Plane of Anemometer Vanes* — The middle plane of the solid of revolution traced out by the vanes of the anemometer.

2.15.2 *Plane of Fan Blades* — The middle plane of the solid of revolution traced out by the fan blades.

2.15.3 *Test Plane* — The horizontal plane containing the plane of the anemometer vanes.

2.16 Pressure

2.16.1 *Absolute Pressure* — That pressure which is exerted equally in all directions at a point. The absolute pressure of the ambient atmosphere is the barometric pressure.

2.16.2 *Static Pressure* — The difference between the absolute pressure at a point, and the absolute pressure of the ambient atmosphere. It is positive when above and negative when below the ambient pressure.

2.16.3 *Velocity Pressure* — The pressure equivalent of the air velocity at any particular point. It is always positive.

2.16.4 *Total Pressure* — The algebraic sum of the static pressure and velocity pressure at any particular point.

2.16.5 *Fan Total Pressure* (*FTP*) — The algebraic difference between the total pressure at the fan outlet and the total pressure at the fan inlet.

2.16.6 *Fan Velocity Pressure* — The velocity pressure corresponding to the average velocity at the fan outlet based on the total outlet area without any deductions for motors, fairings, or other bodies.

2.16.7 *Fan Static Pressure* (*FSP*) — The algebraic difference between the fan total pressure and the fan velocity pressure at the fan outlet.

2.17 Power Supply Cord — A flexible cable or cord, for supply purposes, fixed to, or assembled with, the fan according to one of the following methods:

> *Type X* attachment which denotes a method of attachment such that the flexible cable or cord can easily be replaced, without the aid of special purpose tools, by a flexible cable or cord not requiring any special preparation;

Type M attachment which denotes a method of attachment such that the flexible cable or cord can easily be replaced, without the aid of special purpose tools, by a special cable or cord with, for example, a moulded-on cord guard or crimped terminations;

Type Y attachment which denotes a method of attachment such that the flexible cable or cord can only be replaced with the aid of special purpose tools normally available only to the manufacturer or his agents;

NOTE — Type Y attachment may be used either with common flexible cables or cords or with special cables or cords.

Type Z attachment which denotes a method of attachment such that the flexible cable or cord cannot be replaced without breaking or destroying a part of the fan.

2.18 Rating — A statement of the operating characteristics assigned to the fan by the manufacturer when tested according to the relevant clauses of the standards on different types of fans.

2.18.1 *Rated Current* — The current assigned to the fan by the manufacturer.

2.18.2 *Rated Frequency* — The frequency assigned to the fan by the manufacturer.

2.18.3 *Rated Frequency Range* — The frequency range assigned to the fan by the manufacturer expressed by its lower and upper limits.

2.18.4 *Rated Input* — The input in watts at rated voltage and normal load and at normal operating temperature assigned to the fan by the manufacturer.

2.18.5 *Rated Operating Time* — The operating time assigned to fan by the manufacturer.

2.18.6 *Rated Speed* — The rotational speed specified by the manufacturer at which the fan develops the specified output at the rated frequency and rated voltage.

2.18.7 *Rated Voltage* — The voltage (for three-phase supply, the voltage between phases) assigned to the fan by the manufacturer.

2.18.8 *Rated Voltage Range* — The voltage range assigned to the fan by the manufacturer, expressed by its lower and upper limits.

2.19 Reducer — That part of an airway which reduces gradually in the direction of the air flow.

2.20 Safety Isolating Transformer — A transformer, the input winding of which is electrically separated from the output windings by an insulation at least equivalent to double insulation or reinforced insulation, and which is designed to supply a fan at safety extra-low voltage.

2.21 Service Value — The air in m^3/min delivery divided by electrical power input to the fan in watts at the voltage and frequency specified for the test.

2.22 Size of Fan — The blade sweep in millimetres.

2.23 Supply Leads — A set of wires connected to the fan in the factory, intended for the connection to fixed wiring and accommodated in a special junction box or compartment within, or attached to the fan.

2.24 Tool — A screw-driver, a coin or any other object which may be used to operate a screw or similar fixing means.

2.25 Type of Enclosures

2.25.1 *Totally Enclosed Type* — An enclosure which prevents circulation of air between the inside and the outside of the case, but not necessarily 'airtight'.

2.25.2 *Ventilated Type* — An enclosure in which the ventilation is not materially obstructed while the live parts are protected mechanically against accidental or careless contact.

2.26 Voltage

2.26.1 *Extra-low Voltage* — A voltage supplied from a source within the fan or its associated controls when the fan is operated at its rated voltage, not exceeding 32 V between conductors and between conductors and earth or, for three-phase supply not exceeding 18·5 V between conductors and neutral, the extra-low voltage circuit being separated from other circuits by basic insulation only.

2.26.2 *Low Voltage* — A voltage not exceeding 250 V under normal conditions.

2.26.3 *Medium Voltage* — A voltage exceeding 250 V but not exceeding 650 V under normal conditions.

2.26.4 *Safety Extra-Low Voltage* — A nominal voltage not exceeding 32 V between conductors and between conductors and earth or, for three-phase supply, not exceeding 18·5 V between conductors and neutral, the no-load voltage not exceeding 38 V and 22 V respectively.

NOTE 1 — When safety extra-low voltage is obtained from the supply mains, it must be through a safety isolating transformer or converter with separate windings.

NOTE 2 — The voltage limits specified are based on the assumption that the safety isolating transformer is operated at its rated supply voltage.

2.26.5 *Working Voltage of a Part* — The maximum voltage to which the part under consideration can be subjected when the fan is operating at its rated voltage and under normal conditions of use.

NOTE 1 — Normal conditions of use include changes of voltage within the fan imposed by likely occurrences such as the operation of a circuit breaker or the failure of a lamp.

NOTE 2 — When deducing the working voltage, the effect of possible transient voltages on the supply mains is ignored.

SECTION II DEFINITIONS RELATING TO DIFFERENT CLASSES AND TYPES OF FANS

3. CLASS OF FANS

3.1 Class I Fan — A fan in which protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in that accessible conductive parts are connected to the protective earthing conductor in the fixed wiring of the installation in such a way that accessible conductive parts cannot become live in the event of a failure of the basic insulation.

NOTE 1 — Class I fans may have parts with double insulation or reinforced insulation, or parts operating at safety extra-low voltage.

NOTE 2 — *For fans intended for use with a flexible cord or cable, this provision includes a protective conductor as part of the flexible cord or cable.*

3.2 Class II Fan — A fan in which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions, such as double insulation or reinforced insulation, are provided, there being no provision for protective earthing or reliance upon installation conditions.

Such a fan may be one of the following types:

a) a fan having a durable and substantially continuous enclosure of insulating material which envelops all metal parts, with the exception of small parts, such as name-plates, screws and rivets, which are isolated from live parts by insulation at least equivalent to reinforced insulation; such a fan is called an insulation-encased Class II type fan.

b) a fan having a substantially continuous metal enclosure, in which double insulation is used throughout, except for those parts where reinforced insulation is used, because the application of double insulation is manifestly impracticable; such a fan is called a metal-encased Class II fan;

c) a fan which is a combination of the Types (a) and (b).

NOTE 1 — The enclosure of an all-insulated Class II fan may form a part or the whole of the supplementary insulation or of the reinforced insulation.

NOTE 2 — If a fan with double insulation and/or reinforced insulation throughout has an earthing terminal or earthing contact, it is considered to be of Class I construction.

NOTE 3 — Class II fan may have parts operating at safety extra-low voltage.

3.3 Class III Fan — A fan in which protection against electric shock relies on supply at safety extra-low voltage and in which voltage higher than that of safety extra-low voltage is not generated.

NOTE — Fans intended to be operated at safety extra-low voltage and having internal circuits which operated at a voltage other than safety extra-low voltage, are not included in the classification and are subject to additional requirements; these requirements are under consideration.

4. TYPES OF FANS

4.1 Air Circulator Fan — A free air fan having two or more propeller type blades directly driven by an electric motor and intended to produce relatively high air velocities axially. It may be mounted on a fixed or variable pedestal or mounted on a bracket.

4.2 Axial Flow Fan — A fan having a cylindrical casing in which the air enters and leaves the impeller in a direction substantially parallel to its axis.

NOTE — Fans covered by IS : 3588-1966* fall under this category.

4.3 Ceiling Fan — A propeller-bladed fan, having two or more blades, driven by an electric motor and provided with a device for suspension from the ceiling so that the blades rotate in a horizontal plane with free air inlet and outlet.

4.4 Centrifugal Fan — A fan in which the air leaves the impeller in a direction substantially at right angles to its axis.

NOTE — Fans covered by IS : 4894-1968† fall under this category.

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* Specification for electric axial flow fans.

† Specification for centrifugal fans.

4.5 Fixed Type Fan — A fan in which the direction of the air flow can be changed by changing the portion of the fan.

4.6 Hand-held Fan — A portable fan intended to be held in the hand during normal use, the motor, if any, forming an integral part of the fan.

4.7 Hot Air Fan — An electrical appliance incorporating a fan and heating elements, the fan blowing air through the heating elements.

4.8 Multi-stage Fan — A fan having two or more impellers working in series.

4.9 Oscillating Type Fan — A fan provided with a device such that the direction of the axis of the air flow is changed automatically and continuously in one plane.

4.10 Pedestal Fan — A propeller-bladed fan having two or more blades directly driven by an electric motor mounted on a pedestal of fixed or variable height and intended for use with free inlet and outlet of air.

4.11 Portable Fan — Either a fan which is moved while in operation or a fan which can easily be moved from one place to another while connected to the supply.

4.12 Propeller Fan — A fan in which the air leaves the impeller in a direction substantially parallel to its axis, designed to operate normally under free inlet and outlet conditions.

4.13 Fan for Recess Mounting — A fan intended to be installed in a prepared recess in a wall, ceiling or in a similar situation.

Note — In general, fans for recess mounting do not have an enclosure on all sides, because for some of the sides protection against electric shock is obtained after installation.

4.14 Rigidly Mounted Fan — A fan which is fixed to support or otherwise secured in a specific situation.

4.15 Stationary Fan — Either a fixed type fan or a fan which cannot be easily moved from one place to another.

4.16 Swivelling Type Fans — A fan provided with a device such that the direction of the axis of the airflow is changed automatically and continuously in more than one plane.

4.17 Table Fan — A small diameter propeller-bladed fan having two or more blades, directly driven by an electric motor, and intended for use with free air inlet and outlet. It may be a table fan or bracket-mounted fan for wall or ceiling mounting.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2

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